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ABSTRACT

A project was conducted to develop a set of curriculum materials for use in implementing an instructional strategy to teach mechanical skills in secondary level exploratory vocational agricultural programs in Arkansas. The specifics of the project were to field test and refine an empirical method for developing and implementing an instructional strategy and to develop related curriculum materials for use in implementing the resultant instructional system. During the project, three teacher workshops were held in order to identify the basic agricultural mechanics skill areas to be addressed, to explain the format for instructional materials that was developed and is utilized by the Mid-America Vocational Curriculum Consortium, to develop instructional materials in the 14 skill areas identified, and to revise and field test the materials. Based on information obtained from a follow-up evaluation document that was mailed out to the 21 participating teachers, a revised draft of the curriculum guide was developed. The project-developed curriculum materials were distributed to all vocational agricultural instructors in Arkansas during the spring of 1983 and were placed into use immediately. (MN)

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FINAL REPORT

Development of a Set of Curriculum Materials for the Implementation of an Instructional Strategy for Teaching Basic Mechanical Skills In Exploratory Vocational Agriculture Classes

Project Number: R82-01

Conducted by

University of Arkansas
Area of Vocational Education
Fayetteville, Arkansas
James A. Scanlon Ph.D. Project Director

In Cooperation With
Vocational and Technical Education Division
Arkansas Department of Education
Little Rock, Arkansas 72201

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INTRODUCTION

This study was designed to solve a definite and well documented problem associated with the Exploratory Vocational Agriculture program in Arkansas. This program is defined by the Arkansas State Department of Education as follows: "Exploratory Agriculture classes must be a full year in length (175 days) and may be offered at the ninth or tenth grade level. Fifty percent of this time will be used on classroom activity studying the broad range of occupational opportunities in the area of technical agriculture and agricultural business. The other fifty percent must be devoted to the shop studying the fourteen basic skill areas with the objective of learning about the occupational opportunities available in the field of agricultural mechanization."

The specific problem to which this project addressed itself was two-fold in nature: First, there was no set of current curriculum materials available which was suitable for the agricultural mechanics portion of the Exploratory program; Second, there was need for a model outlining the mechanics part of the program and how it should be conducted.

OBJECTIVES

The two objectives of the project were to: (1) Field test and refine the theoretically derived instructional strategy model shown in Figure 1 and; (2) Develop a set of objective based curriculum materials around which the above mentioned model could be implemented and which would constitute an instructional system. This new system will be used in the Exploratory Agriculture portion of the Agricultural Education program as outlined by the Arkansas State Department of Education.

PROCEDURES

The methodology and procedures used in the project were designed to accomplish the two project objectives within the constraints of time, talent and facilities available. The personnel for the project was a group of 21 Arkansas Vocational Agriculture teachers and a Research Associate employed at 40% of full time. A series of two day workshops were held during the three consecutive months of January, February and March of 1982 at a central location. These workshops were conducted by the project director and research associate and are outlined below:

Workshop #1

1. The fourteen basic skill areas in which instruction is needed were identified by the 21 participating teachers in consultation with members of the Arkansas State Department of Education and the University of Arkansas faculty. A list of specific skills was identified around which the instructional materials would be developed within each of the areas.

2. The format for the instructional materials developed and utilized by the Mid-America Vocational Curriculum Consortium of which Arkansas is a member, was explained to the teachers. Specific instruction was given in the generation of behavioral objectives and the subsequent categories of materials provided for in the MAVCC format.

3. Specific areas were assigned to specific teachers to begin work on rough drafts of the instructional materials in the 14 skill areas identified.

4. Each teacher was contacted by telephone one week following the workshop to identify problems they were having with their rough draft preparation.

A MODEL OF AN INSTRUCTIONAL STRATEGY FOR TEACHING BASIC MECHANICAL SKILLS IN EXPLORATORY VOCATIONAL AGRICULTURE CLASSES

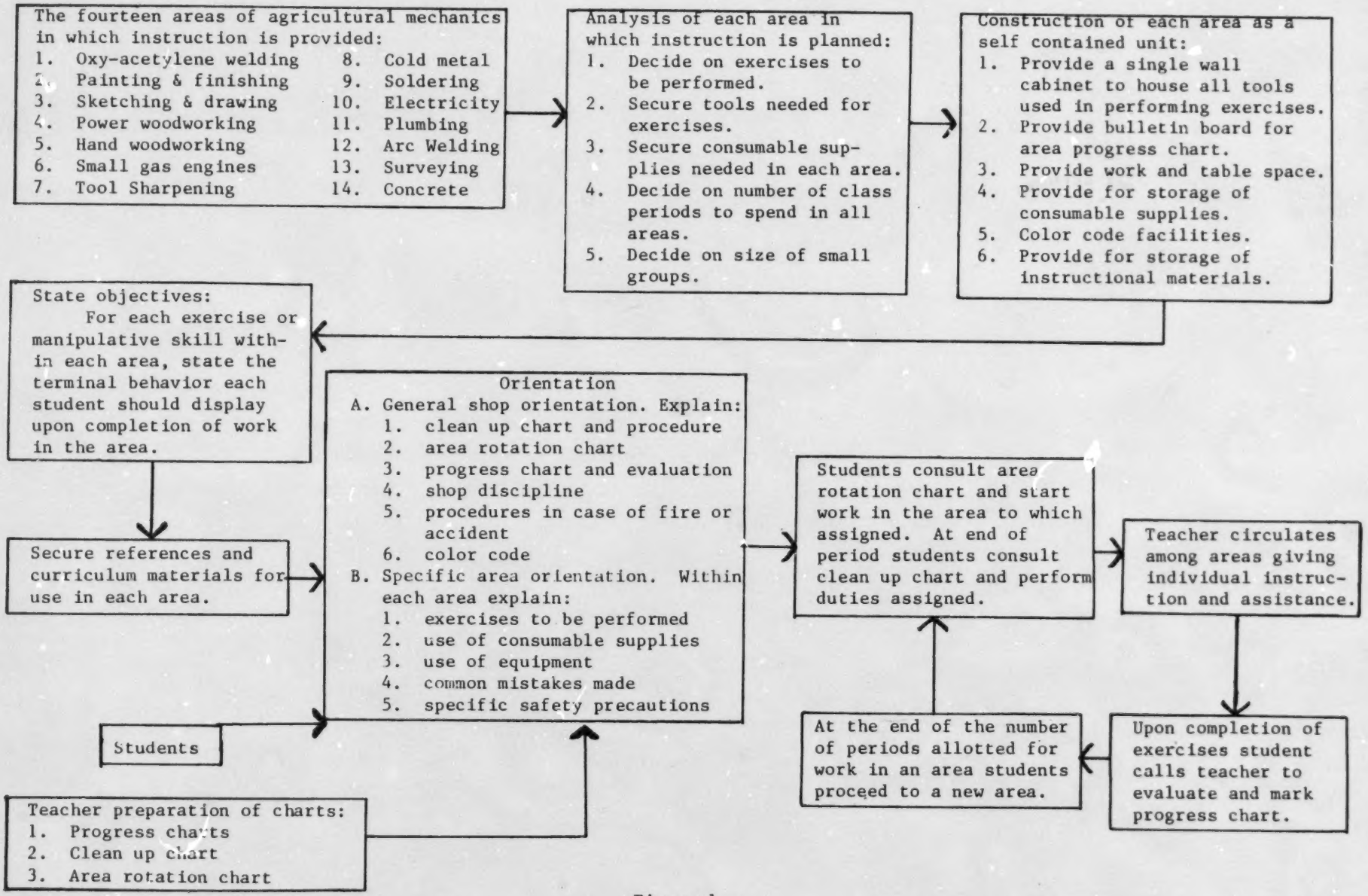
The fourteen areas of agricultural mechanics in which instruction is provided:
1. Oxy-acetylene welding
2. Painting & finishing
3. Sketching & drawing
4. Power woodworking
5. Hand woodworking
6. Small gas engines
7. Tool Sharpening
8. Cold metal
9. Soldering
10. Electricity
11. Plumbing
12. Arc Welding
13. Surveying
14. Concrete
Analysis of each area in which instruction is planned:
1. Decide on exercises to be performed.
2. Secure tools needed for exercises.
3. Secure consumable supplies needed in each area.
4. Decide on number of class periods to spend in all areas.
5. Decide on size of small groups.
Construction of each area as a self contained unit:
1. Provide a single wall cabinet to house all tools used in performing exercises.
2. Provide bulletin board for area progress chart.
3. Provide work and table space.
4. Provide for storage of consumable supplies.
5. Color code facilities.
6. Provide for storage of instructional materials.
State objectives:
For each exercise or manipulative skill within each area, state the terminal behavior each student should display upon completion of work in the area.
Secure references and curriculum materials for use in each area.
Orientation
A. General shop orientation. Explain:
1. clean up chart and procedure
2. area rotation chart
3. progress chart and evaluation
4. shop discipline
5. procedures in case of fire or accident
6. color code
B. Specific area orientation. Within each area explain:
1. exercises to be performed
2. use of consumable supplies
3. use of equipment
4. common mistakes made
5. specific safety precautions
Students
Teacher preparation of charts:
1. Progress charts
2. Clean up chart
3. Area rotation chart
Students consult area rotation chart and start work in the area to which assigned. At end of period students consult clean up chart and perform duties assigned.
Teacher circulates among areas giving individual instruction and assistance.
Upon completion of exercises student calls teacher to evaluate and mark progress chart.
At the end of the number of periods allotted for work in an area students proceed to a new area.

Figure 1

Workshop #2

The second workshop was devoted primarily to discussing problems the teachers were having with the MAVCC format and with securing illustrations.

1. An in-depth examination and discussion of one specific area was done to illustrate and identify the problems each was having with his/her respective assignments.

2. The entire remainder of the workshop was devoted to having each teacher use transparencies to present his/her respective materials to the entire group for their constructive criticism.

Workshop #3

The third and final teacher workshop was devoted to an intensive work session of polishing up the materials the teachers were to turn in which would comprise the field test edition of the instructional materials.

The field test edition was reproduced and disseminated to all of the teachers in the state during the annual teacher's conference in Little Rock. The 21 paritcipating teachers were instructed to conduct instruction in accord with the instructional strategy model previously presented.

A follow-up evaluation document was mailed out to the 21 participating teachers to solicit feedback on the field test edition of the instructional materials and the instructional strategy model. The input was incorporated into the final draft of the curriculum guide.

FINDINGS

The result and accomplishments of the project were determined by the extent to which the two project objectives were accomplished. Specific findings are presented for each of the objectives below:

Objective #1 Field test and refine the theoretically derived instructional strategy model. The model was followed by each of the 21 participating teachers. It was determined the model itself is theoretically and philosophically sound.

Objective #2 Develop a set of objective based curriculum materials which when used with the above model would constitute an instructional system. Curriculum materials were developed for each of the fourteen basic skill areas that were identified. They include: oxy-acetylene welding, arc welding, cold metal, sheet metal and soldering, sketching and drawing, electricity, plumbing, small engines, surveying, concrete, tool fitting, hand woodwork, power woodwork, and painting and finishing. The materials were field tested and revised prior to production of the final edition.

EVALUATION

The evaluation design for this project involved the two primary aspects of evaluation and their application to a developmental type project: Process evaluation and Product evaluation. The products in this study were a curriculum guide in agricultural mechanics and an instructional model. The process was the step-by-step procedure involved in the accomplishment of the two objectives. The evaluation is presented below as it relates to accomplishment of the two objectives.

Objective #1 Field test and refine and impirical model for the development and implementation of an instructional strategy. The process involved presenting the model to the 21 participating teachers and instructing them to field test the curriculum materials using the modular format. The model itself received no refinement and is presented in this report just as it was proposed. The participating teachers provided no feedback about the model when asked to do so in the letter requesting feedback. (Appendix A)

Objective #2 Develop the related curriculum materials to implement this resultant instructional system. The process involved identifying and developing basic instructional skills materials in fourteen areas of agricultural mechanics. The materials were developed by the 21 participating agriculture teachers and field tested in actual classroom situations. Feedback was solicited from each of the teachers and incorporated into the final draft of the materials.

During final draft preparation, the "Criteria for Evaluating a Module" in Appendix C was used for each of the fourteen instructional units. This evaluation criteria was developed by the Mid-America Vocational Curriculum Consortium for persons developing materials according to the MAVCC format.

CONCLUSION

The final conclusion that could be drawn from this project is that the two objectives were successfully accomplished. The curriculum materials in final form were distributed to all Vocational Agriculture Instructors in the state during the Spring of 1983 and were placed in use immediately. It is further concluded that the instructional model

is being followed in that there were no revisions from the way the model was originally proposed. Together the two products constitute an instructional system which will be recommended for all Exploratory Vocational Agriculture classes in Arkansas.

RECOMMENDATIONS

On the basis of experience with this project the following recommendations are appropriate. It is recommended that:

1. Teachers not be used to actually write curriculum materials, but rather employed as "input committees" for identifying and sequencing content.

2. Additional work be done on adapting the MAVCC format for small groups and individualized instructional use.

3. Additional Job sheets be developed which can be added to the existing Job sheets in the fourteen (14) instructional areas.

APPENDIX

A. Feedback Letter

B. List of Participants

C. Evaluation Criteria for a Module

APPENDIX A

TO: Vocational Agriculture Teachers Participating in the Exploratory Agricultural Mechanics Curriculum Development Project

FROM: James A. Scanlon and JoAnn McKim

DATE: September 14, 1982

RE: Feedback on Field Test Edition of Curriculum Guide and Instructional Model

As you are aware, the curriculum guide for exploratory agricultural mechanics you received at the state vocational conference in Little Rock is the field test edition of the guide. We are now ready to prepare a copy for the final printing of the guide and need your input. Please critique the unit in the guide you helped to write and send us your suggestions. We especially need input on the following items:

1. Objectives - relevancy, any additional cognative items needed
2. Information sheets - length, difficulty, clarity
3. Job sheets - too few, too many, illustrations, difficulty, clarity
4. Test - difficulty
5. Problems with the instructional model

Please make any comment you deem appropriate. Longhand on notebook paper is o.k.! We need this by October 1, 1982.

Thanks for your help!

JAS:tr

APPENDIX B

Participant List

Development of a Set of Curriculum Materials for the Implementation of an Instructional Strategy for Teaching Basic Mechanical Skills in Exploratory Vocational Agriculture Classes.

Mr. Anthony Ashlock	VoAg Instructor	Weiner, AR
Mr. Troy Buck	" " "	Hope, AR
Mr. Jesse Bush	" " "	Vilonia, AR
Mr. Ralph Cheshier	" " "	Jonesboro, AR
Mr. Melvin Daniel	" " "	Pearcy, AR
Mr. Rick Bransford	" " "	Hazen, AR
Mr. J. R. Buckner	" " "	Lake Village, AR
Mr. James Cannon	" " "	Prescott, AR
Mr. Bob Collard	" " "	Bee Branch, AR
Mr. David Foreman	" " "	Gentry, AR
Mr. Edward Hartford	" " "	Earle, AR
Mr. Glenn Higginbotham	" " "	Springdale, AR
Mr. Floyd Morris, Jr.	" " "	Gillham, AR
Mr. Steve Patton	" " "	Greenwood, AR
Mr. Jack Still	" " "	Hope, AR
Mr. Thomas Johnson	" " "	Greenway, AR
Mr. Jack Parish	" " "	Mansfield, AR
Mr. Larry Robertson	" " "	Cabot, AR
Mr. Melvin Witherspoon	" " "	Newport, AR
Mr. Unice Latimer	Supervisor	Little Rock, AR

APPENDIX C

CRITERIA FOR EVALUATING A MODULE

The following pages are designed to help evaluate the quality and content of a module. Of course, the quality of the module contents and the expertise with which it is written will require a more careful examination than these criteria allow. However, if the answer to each of the questions on this criteria guide is "yes," the module is surely headed in the right direction.

Study your module very carefully. If you cannot answer "yes" to each of the questions on this criteria guide, perhaps you need to do some more work on your module.

CRITERIA FOR TERMINAL AND SPECIFIC OBJECTIVES

	Yes	No
Terminal Objective:		
1. Does the terminal objective begin with the words "After completion of this module. . ."?	____	____
2. Does the terminal objective adequately describe in general and inclusive behavioral terms what the entire module is about?	____	____
3. Does the terminal objective avoid being too specific or too general?	____	____
4. Do the sentences in the terminal objective include		
a. "Who," which in this case is the student?	____	____
b. "What," which is the observable behavior that is expected of the student?	____	____
c. "How much," or a precise explanation of what the student is expected to accomplish and to what degree?	____	____
5. Does the terminal objective avoid using such vague terms as "will have an understanding of" or "will have knowledge concerning," etc.?	____	____
6. Does the terminal objective avoid using either of the pronouns "he" or "she"?	____	____
7. Does it avoid referring to the student in the singular?	____	____
Specific Objectives:		
1. Are the specific objectives preceded by the phrase "After completion of this module, the student should be able to" in order to avoid repetition of the phrase for each seperate specific objective?	____	____
2. Does the first specific objective deal with terms and definitions that will be included in the module?	____	____
3. Are the specific objectives concise and clear?	____	____

	Yes	No
4. Do the specific objectives incorporate all of the activities which should be included in order to reach the terminal objective?	____	____
5. Is the performance desired in the specific objectives stated in precise terms, such as "name," "demonstrate," "identify," "state a rule," "apply a rule," "describe," "order," "distinguish," or "consturct"?	____	____
6. Where appropriate, do the specific objectives call for a definite number?	____	____
7. Do the objectives indicate stategies to be used in teaching?	____	____
8. Do the objectives determine the criteria to be used in evaluation?	____	____
9. Do the objectives determine prior knowledge of the students?	____	____
10. Are personal pronouns left out of the specific objectives?	____	____
11. Are the objectives stated in such a way that a test question can be written to test to see if the students have reached the objective?	____	____
12. If the word "discuss" is used in stating an objective		
a. Does it indicate whether the response is to be oral or written?	____	____
b. Does the objective indicate the approximate length of the desired response?	____	____
13. If an "identify" objective or one of its synonyms is used, does the individual arrange three or more objects or events in sequence based on a states property.	____	____
14. If a "name" objective or one of its synonyms is used, does the individual supply a name for objects, events, or people?	____	____
15. If an "order" objective or one of its synonyms is used, does the individual arrange three or more objects or events in a sequence based on a stated property?	____	____
16. If a "describe" objective or one of its synonyms is used, does the individual		

		Yes	No
	relate sufficient characteristics or properties of an object or event so that a second individual will be able to state what is being discussed?	____	____
17.	If a "distinguish" objective or one of its synonyms is used, does the individual select an object or event from two or more which are easily confused?	____	____
18.	If a "construct" objective or one of its synonyms is udes, does the individual make a physical object, a verbal statement, or a drawing?	____	____
19.	If a "state a rule" objective or one of its synonyms is used, does the individual communicate a relationship or principle which could be used to solve problems or perform a task?	____	____
20.	If an "apply a rule" objective or one of its synonyms is used, does the individual supply an answer to a problem by using a stated relationship or principle?	____	____
21.	If a "demonstrate" objective or one of its synonyms is used, does the individual perform several operations necessary to carry out a specified process?	____	____

CRITERIA FOR SUGGESTED ACTIVITIES AND INSTRUCTIONAL MATERIALS SECTION

Suggested Activities:

1.	Is this section divided into two parts, the suggested activities for the instructor and those for the student?	____	____
2.	Do the suggested activities assist in the preparation stage of the module?	____	____
3.	Does this section list clearly all major activities which the instructor must do in order to successfuliy teach this module?		
	a. Arrange for speakers, trips, films, etc.	____	____
	b. Provide student with objective sheet.	____	____
	c. Provide student with information, assignment (job) sheet(s).	____	____

	Yes	No
d. Make transparencies.		
e. Discuss terminal and specific objectives.		
f. Discuss information (assignment) sheets.		
g. Demonstrate and discuss procedures outlined in job sheet(s).		
h. Give test.		
4. Does the suggested activities section list all major activities the student must do?		
a. Read the objective sheet.		
b. Study the information sheet.		
c. Complete assignment sheet(s).		
d. Demonstrate the ability to accomplish the procedures outlined in the job sheet(s).		
e. Take test.		
5. Is this section in outline form?		
6. Do the activities follow a logical order stating what must be done first, second, third, etc.?		
7. Is this section designed to be a helpful aid for the teacher?		
Instructional Materials		
1. Does this section list all instructional materials needed to successfully teach this module?		
2. Does it list separately each part of the module?		
a. Objective sheet		
b. Information sheet		
c. Transparency master(s) by name, number, title		
d. Assignment sheet(s) by name, number, title		

	Yes	No
e. Answers to assignment sheet(s)	____	____
f. Job sheet(s) by name, number, title	____	____
g. Test	____	____
h. Answers to test	____	____
3. Does it give complete bibliographic listing of all instructional materials that may be used to supplement this module?	____	____
4. Are the bibliographic listings stated in proper form, including aut-or, title, place of publication, publisher, and date of publication?	____	____
5. Whenever feasible, is an approximate price given for all materials suggested for purchase?	____	____
6. Does the instructional materials section contain an appropriate variety of audio-visual aids?	____	____

CRITERIA FOR THE INFORMATION SHEET

1. Are the items listed in the same order as the specific objectives were given and with word headings as near as possible to the corresponding objectives?	____	____
2. Does each item parallel a specific objective?	____	____
3. Does item one deal with terms and definitions?	____	____
4. Are all terms and definitions included which the student needs to know to complete the module?	____	____
5. Does the information sheet provide all information needed to reach the specific objective?	____	____
6. Does each item contain basic information that can be measured by a test question?	____	____
7. Does the information sheet include knowledge items necessary for motor performance activities?	____	____
8. Is the information sheet presented in topical outline form?	____	____

	Yes	No
9. Is the information sheet designed to serve as a useful guide?	____	____
10. If a transparency or handout supplements the information given on the information sheet, is its name and number given in parentheses beside the item?	____	____
11. Is the student referred to additional material when applicable?	____	____
12. If appropriate, does the information sheet provide supportive information in the form of notes, examples, and cautions?	____	____
13. Is a note		
a. Stated in a complete sentence and enclosed in parentheses?	____	____
b. Used as supplemental, "nice-to-know" information only, not information that is testable?	____	____
14. Is a caution		
a. Stated in a complete sentence and enclosed in parentheses?	____	____
b. Used for safety purposes?	____	____
15. Is an example		
a. Not enclosed in parentheses?	____	____
b. Not necessarily a complete sentence but a phrase, word, or problem?	____	____
16. Do all transparencies		
a. Provide illustrations for identification and/or assist students with clarification?	____	____
b. Appear in parentheses after the appropriate section of the information sheet?	____	____
c. Have titles which agree exactly with the titles appearing in the suggested activities section?	____	____
d. Have labels, parts, or tools stated exactly as they appear on the information sheet?	____	____

	Yes	No
e. Cover only one concept each?	____	____
f. Have neat, clear printing and attractive artwork?	____	____
g. Have a minimum of one-inch margins on all sides?	____	____
h. Have a minimum amount of writing on each transparency?	____	____

CRITERIA FOR ASSIGNMENT SHEETS AND ANSWERS

1. Does the assignment sheet title agree with the objective sheet, suggested activities section, and test?	____	____
2. Does the title of the assignment sheet contain an action verb?	____	____
3. Does the assignment sheet parallel a specific objective?	____	____
4. Does the assignment sheet effectively describe an activity whose accomplishment would enable a sutdent to complete a specific objective?	____	____
5. Does the assignment sheet identify a tangible outcome which will result after the student has completed the assignment?	____	____
6. Is the terminology in each assignment parallel to that which will be used in a test question?	____	____
7. Do assignment sheets provide problem solving activities, give the opportunity for appropriate practice activities, or provide self-assessment activities?	____	____
8. Has sexism been avoided by referring to the learner as "student", "participant," or "learner"?	____	____
9. Are the directions provided in the assignment sheet clear and concise?	____	____
10. Do directions provide enough guidance for the student to successfully complete the assignment sheet?	____	____

	Yes	No
11. Is the assignment sheet designed so that it talks directly to the student?	____	____
12. Is an appropriate variety of assignments given?	____	____
13. Are answers to assignment sheets provided if necessary?	____	____
14. If an answer calls for discussion or demonstration, are key points listed which should be included?	____	____

CRITERIA FOR JOB SHEETS

1. Is the job sheet a procedure sheet giving complete instructions on how to perform in the proper seqence the operations necessary to successfully a production job?	____	____
2. Does the title of the job sheet agree exactly with the objective sheet, suggested activities section, and test?	____	____
3. Does the job sheet include tools, materials, and procedure?	____	____
4. Does each letter or number describe only one step in the procedure?	____	____
5. Do all steps begin with a verb?	____	____
6. Does the job sheet provide diagrams and illustrations?	____	____
7. Are figures, diagrams, illustrations referenced in parentheses after the corresponding steps?	____	____
8. If figures pertain to notes, are they referred to in a complete sentence and included inside the parentheses?	____	____

Example: (NOTE: Remember to alternate beads to prevent distortion. See Figure 5.)

CRITERIA FOR TEST AND ANSWERS TO TEST

1. Do the test items follow the same sequence as the specific objectives?	____	____
2. Is there a test item for each specific objective?	____	____

		Yes	No
3.	Are the test items stated in clear, concise language?	____	____
4.	Will the answer to the test item show the teacher the degree of knowledge the student has concerning the specific objective?	____	____
5.	Does the terminology used on the test parallel that of the specific objective?	____	____
6.	Do the test questions test for the same performance as called for by the specific objectives?	____	____
7.	Are there both cognitive and motor performance test items?	____	____
8.	Does the test provide criterion referenced evaluation?	____	____
9.	Does the test determine the needs of the student?	____	____
10.	After the test questions for assignment and job sheets, is the following note included: (NOTE: If the above activities have not been accomplished prior to the test, ask your instructor when they should be completed.)?	____	____
11.	Is an acceptable answer provided for each test question on a separate sheet entitled "Answers to Test"?	____	____
12.	Are the test answers states exactly as they appear on the information sheet?	____	____
13.	If an answer calls for discussion or demonstration, are key points listed which should be included?	____	____